

## DIVISION 3 - CONCRETE

### SECTION 03410

#### PRECAST CONCRETE VAULT & MANHOLE

#### PART 1 - GENERAL

##### 1.1. SCOPE OF WORK

- A. The work covered by this section of the specifications consists of furnishing all plant labor, equipment, appliances, and materials and in performing all operations in connection with the construction of precast concrete structures, complete, in strict accordance with this section for the specifications and the applicable drawings and subject to the terms and conditions of the contract. As an alternative to providing the precast concrete structures shown on the plans and described herein, the Contractor may provide either:
- B. Extent of structural precast concrete work is shown on drawings and in schedules.
- C. Structural precast concrete includes vaults, wet well and manholes.
- D. Related Specifications
  - 1. Division 2 - Section 02250, SITEWORK
- E. All manholes shall be in accordance with the Loudoun County Sanitation Authority (LCSA) Design Standards.

##### 1.2 APPLICABLE STANDARDS

- A. American Society for Testing Materials (ASTM) C478, D1752, A48, C858
- B. Federal Specification QQ-I-652 for Gray Iron Castings
- C. Corps of Engineers CRD-588
- D. AASHTO M 198
- E. ACI 301 "Specifications for Structural Concrete for Buildings".
- F. ACI 318 "Building Code Requirements for Reinforced Concrete".
- G. ACI 350 "Environmental Engineering Concrete Structures".

H. Concrete Reinforcing Steel Institute, "Manual for Standard Practice".

## PART 2 - MATERIALS

### 2.1 SUBMITTALS

- A. Shop Drawings: Submit engineering calculations and shop drawings prepared under supervision of and stamped by a licensed structural engineer, registered in the Commonwealth of Virginia, showing complete information for fabrication and installation of precast concrete units or alternative cast in place concrete structures. Indicate plan and cross-section; location, size and type of reinforcement, including special reinforcement and lifting devices necessary for handling and erection. Show the location of all hatch covers, access doors, ventilation fans, vent pipes and pipe penetrations. Indicate layout, dimensions, and identification of each precast unit. Indicate welded connections by AWS Standard symbols. Detail inserts, protective liner, embeds, connections, and joints, including accessories and construction at openings in precast units. Indicate information on all materials including concrete and reinforcing steel verifying compliance with the specifications.
- B. Certify compliance with the referenced ASTM standards specified herein.
- C. A packing list or invoice shall accompany each shipment of material.
- D. Submit manufacturer's specifications and instructions for manufactured materials and products. Include manufacturer's certifications and laboratory test reports as required.
- E. Submit catalogue information for all materials and items furnished with the precast concrete structure.

### 2.2 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firms which have two (2) years successful experience in fabrication of precast concrete units similar to units required for this project will be acceptable. Fabricator must have sufficient production capacity to produce required units without causing delay in work. Fabricator of precast concrete wet well must have experience with the installation of the specified protective liner.

Design requirements: All sections shall be designed to meet the requirements of ACI 350 "Environmental Engineering Concrete Structures".

### 2.3 WATERTIGHT STRUCTURES

- A. Precast concrete structures shall be watertight to prevent any groundwater or surface water from entering the structure. A bentonite waterstop 6 inches thick and 6 inches above and below joints shall be used.

- B. The number of section joints for the precast concrete structures shall be held to a minimum. The minimum height of sections shall be four (4) feet except the top section.

#### 2.4 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60, Unless otherwise indicated.

#### 2.5 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type II.
- B. Use only one brand and type of cement throughout project, unless otherwise accepted by the Engineer.
- C. Concrete for all structures shall have a minimum compressive strength of 4,000 psi.
- D. Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.
- E. Water: Potable
- F. Air-Entraining Admixture: ASTM C 260.
- G. Water-Reducing Admixture: ASTM C 494, Type A, or other Type approved for fabricator's units.

#### 2.6 GROUT MATERIALS

- A. Cement Grout: Portland cement, ASTM C 150, Type II, and clean, natural sand, ASTM C 404. Mix at ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum water required for placement and hydration.
- B. Non Metallic Shrinkage-Resistant Grout: Pre-mixed, non-metallic, non-corrosive, non-straining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-C621.

#### 2.7 ADMIXTURES

- A. Use air-entraining admixture in concrete, unless otherwise indicated.

- B. Use water-reducing admixtures in strict compliance with manufacturer's directions. Admixtures increase cement dispersion, or provide increased workability for low-slump concrete, may be used subject to Engineer acceptance.
- C. Use amounts as recommended by admixture manufacturer for climatic conditions prevailing at time of placing. Adjust quantities of admixtures as required to maintain quality control.

## 2.8 FABRICATION

- A. Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified.
- B. Delete references for allowing additional water to be added to batch for material with insufficient slump. Addition of water to batch will not be permitted.

## 2.9 VAULT AND MANHOLE

- A. Precast Base: Precast base sections shall be installed on a firm stabilized foundation prepared similar to that required for the proper installation for the adjacent pipeline as described elsewhere in the specifications. Precast base sections may be supplied by the manufacturer with precast inverts, or the inverts may be cast in the field by the Contractor. Manholes base shall be monolithic with the base integrally cast with the walls.
- B. Precast Sections: Precast manhole sections shall be manufactured in accordance with current ASTM Standard C478. Precast sections shall not have lift holes through the wall of the structure. Keyways or other provisions shall be included for lifting structure as approved by the LCSA for pump station structures. These holes shall be tapered and shall be plugged with mortar after installation and made watertight. Joint in the manhole sections shall be formed entirely of concrete employing rubber o-ring gaskets or Type 4G precision rubber gaskets by Press-Seal Gasket Corporation or equal and when assembled shall be self centering and make a uniform watertight joint.
- C. Precast Top Slabs: Precast concrete flat tops for the comminutor vault, wet well, valve vault and meter vault shall be designed for AASHTO HS-20 loadings using Working Stress Design. The sealed shop drawings shall indicate that these tops are designed for AASHTO- HS-20.
- D. Where manhole is required to have a watertight frame and cover, the cone shall contain cast iron inserts meeting current ASTM Specifications A-48. An approved Joint Sealer, Ram-Neck or approved equal, shall be used between all sections of

adjusting rings, cone section of adjusting rings, cone section and casting and be bolted so as to assure a tight seal.

2.10 WATERTIGHT WORK REQUIRED

- A. Manholes and vaults shall be completely watertight. All leaks shall be repaired immediately with a non-shrink material, or the entire work removed and rebuilt.
- B. Ground water must be kept below all parts of the masonry or concrete foundations and walls until the mortar and concrete has obtained an adequate set.

2.11 MANHOLE FRAMES AND COVERS

- A. Manhole frames and covers shall be furnished and installed.

2.12 MANHOLE STEPS

- A. Manholes steps shall be made of plastic or rubber covered steel and shall conform to the requirements of ASTM C478. Steps shall be M.A. Industries model PS2-PF or equal.

2.13 ALUMINUM ACCESS DOORS

- A. Frames shall be designed to direct rain water via the channel to a drain connection. The Contractor shall extend the drains with watertight 1-1/2 inch PVC pipe. Doors shall be equipped with a minimum of two heavy duty stainless steel hinges with stainless steel pins, stainless steel torsion spring to afford easy operation and an automatic hold-open arm. A snap lock with removable handle shall be provided along with a locking hasp and eye bolt, so that the hatch covers can be locked closed with a padlock keyed to the Loudoun County system furnished by the Contractor. A 1-1/2 inch drain coupling shall be provided and located as directed by the Engineer. All material will have a standard mil finish. The embedded portion of the frame shall have a heavy shop coat of bituminous paint where in contact with concrete.
- B. Hatch frames and covers shall be Type "B" as manufactured by Washington Aluminum Company, Inc., Baltimore, Maryland, or equal and as shown on the drawings. Door shall be aluminum diamond pattern plate, alloy 6061-T6. Frames shall be aluminum extrusions, alloy 6063-T6, with continuous anchor features incorporated.

2.14 LINK SEALS

- A. All pipe penetrations shall be equipped with Link-Seal modular seals by Pipeline Seal

and Insulator, Inc. Houston Texas or equal. The Link-Seal modular seals shall be rated to withstand pressures greater than 20 psi. Link-Seal modular seals shall be sized and installed in accordance with the manufacturer's recommendations for sealing manhole and vault penetrations.

## 2.15 APPURTENANCES AND WATERPROOFING

- A. Jointing mastic shall be elastic resistant formulation of plastic bituminous materials and inert filler so combined that when applied to vertical metal surface and heated to 120 degrees F, the jointing mastic will neither slump nor lose plasticity. When applied directly from the container without further fixing, the jointing mastic can be applied in an even adherent coat within the temperature range of 20 degrees to 100 degrees F.
- B. Asphalt base waterproof coating exterior of all manholes other than the wet well, comminutor vault, valve vault and meter vault shall be mineral filled solvent type meeting the requirements of MIL-C-82052. Coating shall be Koppers Bitumastic No. 300-M Coal Tar Epoxy or equal. Coating thickness shall be 16 mil DRT minimum.
- C. Quick setting non-shrink grout shall conform to requirements of Corps of Engineers CRD 588, octocrete, speedcrete or equal.
- D. Flexible gasket between manhole and manhole frame shall be extruded rope type B, in accordance with AASHTO M-198, butyl based, 3/4 -inch diameter minimum.
- E. Expansion joint filler shall be Type 1 in accordance with ASTM D-1752.

## 2.16 DELIVERY, STORAGE AND HANDLING

- A. Deliver precast concrete units to project site in such quantities and at such times to assure continuity of installation. Store units at project site to prevent cracking, distortion, staining, or other physical damage, and so that markings are visible. Lift and support units at designated lift points.
- B. Deliver anchorage items which are to be embedded in other construction before of such work. Provide setting diagrams templates, instructions and directions as required for installation.

## 2.17 TEST FOR WATER TIGHTNESS

- A. The precast air/vacuum valve vault shall be tested for water tightness by filling with water and measuring the drop in level due to leakage, if any. Water supplied for the

initial testing shall be provided by the Contractor. The Contractor shall also pay for any retesting if required. Perform water tightness test after precast concrete structure is capable of resisting the hydrostatic pressure of the water test. Install all pipe with plugs suitable for test pressures.

1. Preparation: Fill the vault with potable water to the top of the vault and let it stand for at least 24 hours.
2. Measurement: Measure the drop in liquid level over the next 72 hours to determine the liquid volume as for comparison with the allowable leakage. Evaporative losses shall be measured or calculated and deducted from the measured loss to determine net liquid loss (leakage). The net liquid loss for a period of 24 hours shall not exceed 0.1 of 1 percent of the structure volume.
  - a. If the leakage exceeds the maximum allowable, the leakage test shall be considered excessive and the structure shall be repaired, and retested until leakage falls within the appropriate limit.
  - b. Damp spots on the wall surface or measurable leakage of water at the wall base shall not be permitted. Damp spots are defined as spots where moisture can be picked up on a dry hand. The source of water movement through the wall shall be located and permanently sealed in an acceptable manner. Leakage through the wall - base joint or footing shall likewise be corrected. Damp spots on the footing are generally to be expected, and are permissible.

END OF SECTION